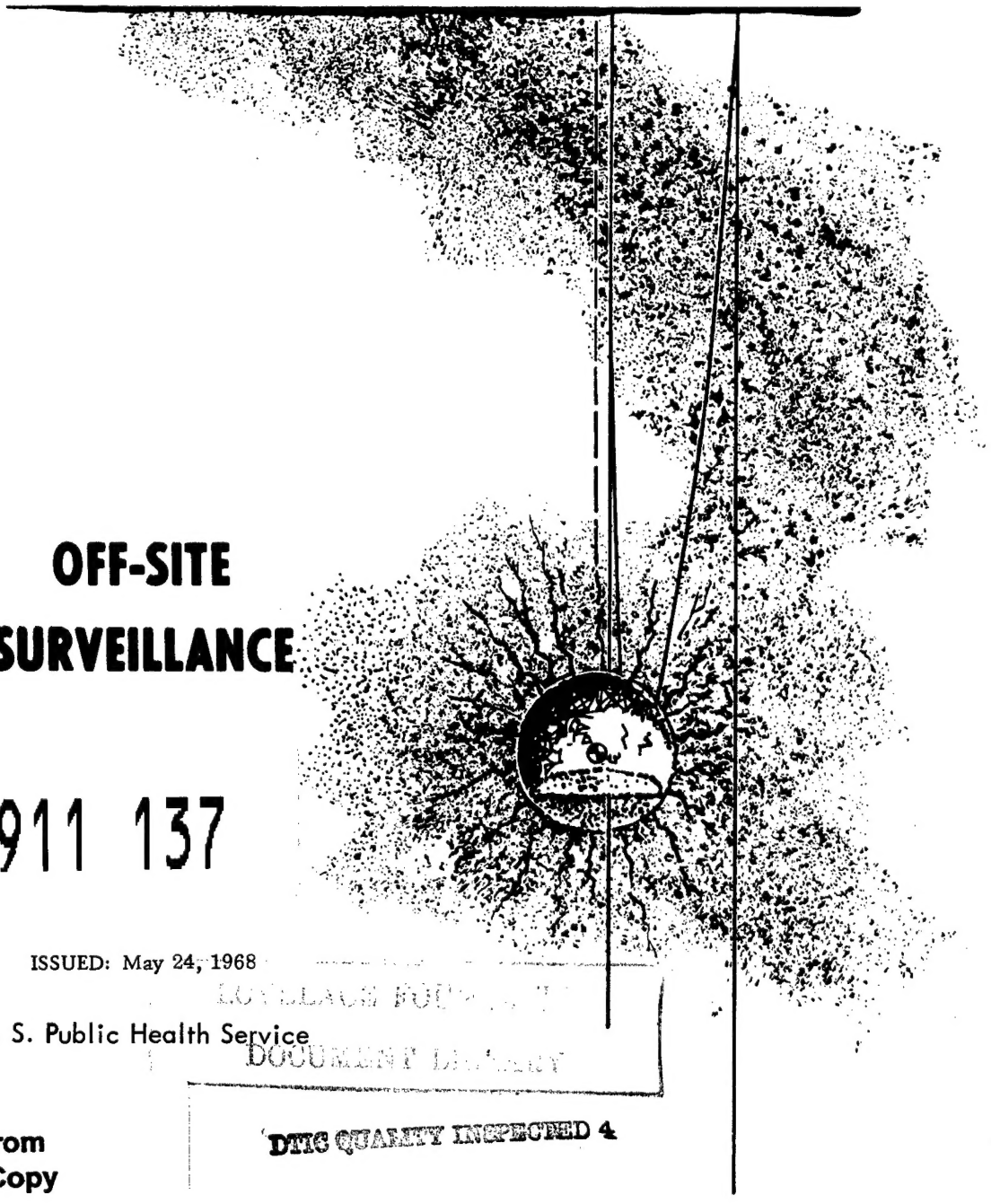
VELA UNIFORM PROGRAM

STERLING EVENT



OFF-SITE SURVEILLANCE

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OFF-SITE SURVEILLANCE
FOR
PROJECT STERLING
December 3, 1966

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Project Officer
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U. S. Department of Defense
U. S. Atomic Energy Commission
Vela Uniform

U. S. Public Health Service

Southeastern Radiological Health Laboratory
Montgomery, Alabama
Southwestern Radiological Health Laboratory
Las Vegas, Nevada

FOREWORD

The information and data presented in this report were compiled to summarize the activities conducted by the Off-Site Radiological Safety Organization relative to Project Sterling. The activities prior to the shot, during the active test period, and immediately post-shot are discussed.

Acknowledgements are extended to the personnel of the Southwestern Radiological Health Laboratory, Las Vegas, Nevada; Southeastern Radiological Health Laboratory, Montgomery, Alabama; and Northeastern Radiological Health Laboratory, Winchester, Massachusetts; and reserve PHS officers (temporary duty) for making the Off-Site Radiological Safety activities successful.

Acknowledgements are also extended to state and local health department officials in Mississippi and Louisiana for their assistance in off-site activities.

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CHAPTER 1

INTRODUCTION

The Sterling Event was the fourth nuclear detonation involved in a study, identified as Project Dribble, sponsored by the Department of Defense's Advanced Research Project Agency. Project Dribble involves the recording and identification of seismic signals from underground detonations. These studies are part of a seismic research program called Vela Uniform which is designed to improve the United States' capability to detect, identify, and locate underground nuclear detonations.

The Sterling Event was fired at 6:15 a.m. CST on December 3, 1966, 19 air miles southwest of Hattiesburg, Mississippi, in the 110' diameter cavity created by the Salmon Event*(see figure 1.1). The nuclear explosive was designed for a 350-ton yield. At shot time, the mean layer winds were from 285° at 12 knots. The surface winds were from 65° at 9 knots.

The Off-Site Surveillance Program for the Sterling Event was conducted by the U. S. Public Health Service Off-Site Radiological Safety Organization. Authorization for this program was established by the AEC-PHS Memorandum of

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* A 5-kiloton nuclear detonation that was fired approximately 2700 feet below the surface of the earth in a formation known as Tatum Salt Dome, Lamar Co., Mississippi, on October 22, 1964.

Understanding and NTSO-SOP Chapter 0524-05, Off-Site Rad-Safety Operations, revised June 26, 1961. Operational supervision of the off-site program during testing periods was delegated by the Project Manager to the Radiological Safety Officer. The functions of the Public Health Service were as follows:

1. Determination by mobile and fixed monitoring stations and aerial surveys the extent of airborne, surface and subsurface contamination off-site resulting from the operation.
2. Maintenance of a comprehensive record of radioactivity associated with the operation, including fluctuations in background data.
3. Insurance of continuing public health protection, including sampling of various media such as water, milk, soil, vegetation and animal tissue, as required.
4. Preparations for effecting emergency measures in the event an unacceptable situation developed.
5. Dissemination of necessary public information in surrounding communities to maintain public confidence in the safe conduct of the operation.
6. Investigation of incidents that might be attributed to the operation.
7. Distribution and collection of film badges.

8. Provision of mobile monitoring teams in selected populated places surrounding the operation site.
9. Location of air-sampling equipment and securance of local personnel for operation of the sampling stations.
10. Evacuation of certain portions of the off-site area* including:
    - Evacuation of certain portions of the off-site area (0 to 2.0 miles from Surface Zero) as a precautionary measure in the event an unforeseen situation developed.
    - Medical support relative to evacuating individuals living in the off-site area who were not physically able to evacuate themselves.

The Off-Site Radiological Safety Organization for the Sterling Event was staffed principally by personnel from the Southwestern Radiological Health Laboratory, Las Vegas, Nevada; Southeastern Radiological Health Laboratory, Montgomery, Alabama; and Northeastern Radiological Health Laboratory, Winchester, Massachusetts; and reserve PHS officers (temporary duty).

The Project Officer was Dr. Melvin W. Carter, Ph.D., Officer in Charge, Southeastern Radiological Health Laboratory, Montgomery, Alabama. The Off-Site Radiological Safety Officer was Mr. O. R. Placak, Officer in Charge, Southwestern Radiological

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* The off-site area is defined as that area within a 50-mile radius of Surface Zero (excluding the test-site area), or as far beyond this area as Public Health Service activities are deemed necessary.

Health Laboratory, Las Vegas, Nevada.

The activities of the Public Health Service were coordinated with the state and pertinent local health departments of Mississippi and Louisiana.

Prior to the detonation, Public Health Service personnel completed a population survey of the area within 5 miles of the test site in order to update the information gathered in 1963-64 relative to the Salmon Event of 1964. This survey was extended out to 10 miles from 270° clockwise to 45°. Results of the survey were used to develop an evacuation plan for certain portions of the off-site area.

A Public Health Service medical officer, utilizing the information gathered by the population survey, visited all the homes within a 5-mile radius where people lived who might need medical attention if an emergency developed.

A milk shed survey was conducted within a 50-mile radius to update the information gathered in 1963-64 relative to the Salmon Event. The milk shed survey was conducted to develop emergency procedures if milk in the off-site area was contaminated as a result of the Sterling Event; and also to develop a milk sampling program in the area to establish existing background radioactivity levels. This survey was coordinated with the state and appropriate local health departments of Mississippi and Louisiana.

An environmental sampling program to determine existing levels of radioactivity and normal variations in these levels was initiated in May 1963 in relation to the Salmon Event. Media sampled included air, water, milk, and vegetation media. The samples were representative of an area bounded by a 50-mile radius from the test site. These samples were analyzed at the Southeastern Radiological Health Laboratory, Montgomery, Alabama; reports were issued on a monthly basis through December 1965 at which time they were issued on a quarterly basis.[1] After conclusion of the Salmon cavity reentry activities of March 1965 the environmental sampling program was gradually decreased to a minimum, which consisted of 4 air sampling stations and 15 water sampling stations. The majority of these stations were within a 5-mile radius of the test site. Prior to the Sterling Event this program was expanded to represent a 50-mile radius coverage.

CHAPTER 2

PROCEDURE

2.1 PRELIMINARY PROCEDURE

2.1.1 Population Survey

Pre-operational activities for the Off-Site Surveillance Program for Project Sterling were initiated on September 7, 1966, at which time a Public Health Service office was established in Hattiesburg, Mississippi.

A population survey in the off-site area was initiated on October 10, 1966. This survey was conducted in order to update population information; i.e., the last time a population survey was conducted in this area was in September 1964. PHS officers began the survey within a 5-mile radius of the test site and worked outward to a 10-mile radius.

The following information was gathered at each residence:

1. the name of the head of the household,
2. the name and age of each person living in the home,
3. the name of anyone in the home who was ill,
4. transportation requirements if an emergency were to develop that would require an evacuation.

The population survey within a 5-mile radius of the test site was completed on November 4, 1966. The survey in the area from 5 to 10 miles from the test site was completed by November 10 from 270° clockwise to 45° (i.e., a sector from west to northeast). No further work was done out to 10 miles since it was determined that if an unexpected release of activity were to occur, the area beyond 5 miles would not be a major concern in regard to evacuation connected with potential radiation exposure.

The population survey within a 5-mile radius revealed that there were 1,200 people representing 314 homes in this area. This information was used in order to develop a pre-shot evacuation program as well as for use in relation to emergency planning.

2.1.2 Milk Shed Survey

(1) 5-50 mile area

Twenty-two counties in Mississippi and one parish in Louisiana were visited during November 4 - 14, 1966, in order to update the milk shed survey information which was collected in 1963. This survey was conducted in cooperation with the State Health Departments of Mississippi and Louisiana. The local milk sanitarians were the primary source of information. The following information was obtained:

(1) The locations of dairy farms and the number of cows milked at each farm,

(2) the names and addresses of the truck drivers who collected the milk, and

(3) the locations of the milk processing plants that received the milk.

The information gathered from this survey was utilized to develop a composite milk sampling program within a 50-mile radius of the test site. It was also utilized to develop an emergency plan in case an unforeseen incident were to occur as a result of Sterling.

In reviewing the information gathered from the milk shed survey, it was determined that 18 composite milk samples representing 220 dairies would give representative coverage of the milk produced within a 50-mile radius of the test site. (See figure 2.1 for the number of dairies that the composite milk samples represented.)

(2) 0-5-mile area

On November 17, 1966, a survey was initiated to evaluate the number of milk cows within a 5-mile radius of the test site. This survey was conducted in order to establish a sampling program representing raw milk that might be consumed by individual families. This survey was completed on November 21, 1966.

Using the information gathered, 7 sampling stations were established within a 5-mile radius of the test site. (See figure 2.2 for the locations of the stations.)

2.1.3 Evacuation

Prior to the shot, it was determined that as a precautionary measure it would be advisable to evacuate those residents living within a 2-mile radius of the test site. The Off-Site Surveillance Program was given the responsibility of developing an evacuation plan using the criteria established by the test organization as a guide.

Utilizing the information gathered from the population survey, the residents who lived within a 2-mile radius of the test site were visited and asked if they would evacuate the day before the shot. Due to the early morning shot schedule (6:00 a.m.) it was deemed desirable to evacuate people the evening prior to the event. It was felt that this procedure would minimize inconvenience to them and preclude trying to conduct such a major activity under nighttime conditions.

Off-site personnel gathered information as to what time the residents would evacuate and where they would go. The evacuees were given the Public Health Service phone number and were instructed to call collect if they had any questions regarding the shot.

Thirty-one families representing 127 people within a 2-mile radius of the test site were contacted in regard to

evacuation. All of the families indicated that they would evacuate the day before the shot, with the exception of one family who planned to leave the day of the shot. (See figure 2.3 for the evacuation area.)

The PHS population survey previously described located 39 "medical cases" within the 5-mile radius. These cases were evaluated by the project medical officer, who personally visited each one. On the basis of how the disorder present affected the movability of the patient, should evacuation be necessary, it was decided whether or not to move the patient prior to the detonation. The nature of the medical problems encountered ranged from pregnancy near term to disorders of the heart and circulatory system. Some neuropsychiatric disorders were encountered.

On the basis of this medical evaluation, it was deemed advisable to evacuate one person by ambulance prior to the detonation.

2.1.4 Structural Survey

On October 19, 1966, Public Health Service officers began contacting off-site residents and supervisors of various

institutions in the area. These contacts were made in regard to a proposed, selective structural survey that was to be conducted by Atomic Energy Commission contractors.

PHS officers obtained permission for the contractors to conduct their survey and were available to answer any specific questions regarding its purpose and nature.

2.1.5 Environmental Sampling

(1) Air Sampling

Four permanent air sampling stations had operated five days a week since the cavity reentry activities of 1965 These samples were collected with the General Metal Works Model 2000 hi-volume air sampler, utilizing a Gelman type E, 8" x 10" glass fiber filter. They were mailed routinely to the Southeastern Radiological Health Laboratory, Montgomery, Alabama, for analysis. Monthly reports containing the analyses data were issued through December 1965, at which time, quarterly reports were issued.

Beginning on November 23, the air sampling network was expanded to include 33 stations within a 50-mile radius of the test site. (See figures 2.4 and 2.5 for the locations of the stations.)

(2) Water Sampling

For November 28, 1966, 37 water sampling stations were established within a 50-mile radius of the test site. These stations represented private, public and stream supplies.

One set of background samples was collected prior to the shot. Since the cavity reentry activities of 1965, 15 water sampling stations had been maintained on a semiannual collection basis. The data regarding the analyses of these samples were issued in the quarterly reports. (For the locations of the 37 water sampling stations see figure 2.6.)

(3) Vegetation Sampling

Twenty vegetation sampling stations were established on November 28, 1966. One set of samples was collected prior to the shot for background purposes. (See figure 2.10 for the locations of these stations.)

(4) Milk Sampling

(a) Composite Sampling (5-50-mile area)

Eighteen composite milk samples representing 220 dairies were collected prior to the shot for background purposes. Sample collection began on November 23, 1966. (Refer to figure 2.1 for the number of dairies represented in these samples in relation to the total number of dairies in the area.)

(b) Family Milk Cows (5-mile area)

Seven milk samples were collected from the stations within the 5-mile area prior to the shot. Sample collection began on November 30, 1966. (For the locations of these sampling stations refer to figure 2.2.)

2.1.6 Film Badge Program

Fifty film badge stations, four badges per station, were established within a 50-mile radius prior to the shot. These stations were activated on November 23, 1966. Nine of the stations were within a 5-mile radius of the test site.

Sixty-six personal film badges were distributed within a 5-mile radius of the site. One person per household was badged within a 2-mile radius. The remainder of the 5-mile area badges were distributed 360 degrees around the site. (For the locations of film badge stations from 5-50 miles, see figure 2.7; for 0-5 miles see figure 2.8.)

2.2 PROCEDURE, STERLING EVENT

2.2.1 Evacuation

The Sterling Event was detonated on December 3, 1966, at 6:15 a.m. CST. Public Health Service officers evacuated those residents living within a 2-mile radius of the test

site the day before the shot with the exception of one family who left the morning of the shot. Thirty-one families, representing 127 people, were evacuated. One medical case within the 5-mile area was also evacuated the day before the shot. (See figure 2.3 for the evacuation zone.) The people who were to be affected by the evacuation were informed on a house-to-house basis and at a public meeting which was held in Baxterville, Mississippi, on November 17, 1966.

After the public meeting a survey was made in order to determine if all the people would evacuate. All the residents within the affected area indicated that they would leave the day before the shot, with the exception of one family who planned to leave at 3:00 a.m. the day of the shot. They were informed on December 2 by Public Health Service officers that the event was scheduled for December 3 at 6:00 a.m. These contacts were made after the afternoon weather briefing held at 3:00 p.m. on December 2.

All residents scheduled for evacuation left their homes the day before the shot with the exception of one family who left at 2:45 a.m. on shot day. This family

raised chickens on a commercial basis and could not conveniently leave their home for an extended period of time.

On the morning of the shot prior to 3:00 a.m., Public Health Service officers visited each house in the 2-mile area to ensure that the evacuation was complete. The Lamar County Sheriff's Department patrolled the evacuation zone the evening of D-1 and up through H-3 on D-day, at which time road blocks were established by the AEC and contracting personnel.

2.2.2 Ground Monitoring

Twenty-five ground monitoring teams were stationed in the off-site area at shot time. They were directed in the field through a central communications control point. The following radiation detection field survey instruments were used: Eberline E-500B; Scintillator, model 111 and Victoreen Radector, Model 500. They were equipped with two-way radios and mobile air sampling capacity. Air samples were collected with the General Metal Works Model 2000 utilizing a Gelman type E, 8" x 10" glass fiber filter and a MSA #2306 organic vapor cartridge.

Ground monitoring began in the field at H-30 minutes and was terminated at H+2 hours. Four PHS monitoring teams were on standby through H + 18 hours. No activity above normal background levels was detected by ground monitors in the off-site area. (See figure 2.9 for the off-site roads that were monitored with negative results.)

2.2.3 Aerial Monitoring

A two-man aerial monitoring team utilizing a USAF helicopter made numerous passes over ground zero and in the off-site area. Instruments used were the Eberline E-500B; Scintillator, Model 111, and Victoreen Radector, Model 500. Aerial monitoring began at H + 15 minutes and was terminated at H + 4 hours, 21 minutes, at which time it was determined that no radiation had escaped to the off-site area. A cloud sampling aircraft also made passes in the off-site area with negative results.

2.2.4 Environmental Sampling

(A) Air Sampling

Thirty-three permanent air sampling stations were operating within a 50-mile radius of the test site at shot time. PHS ground monitors in the field were also equipped with air sampling units for mobile air sampling. (See figures 2.4/2.5 for permanent air sampling station locations.)

On D-day, after the shot, samples were collected from 9 stations that were operating within a 5-mile radius and one station in Purvis. These samples were analyzed at the laboratory in Hattiesburg, Mississippi.

In addition to the permanent air sampling stations, three sampling units were set up in the downwind sector and were operated by portable generators. All sampling units consisted of a General Metal Works, Model 2000, hi-volume air sampler utilizing a Gelman type E, 8" x 10" glass fiber filter. Selected stations ran MSA #2306 organic vapor cartridges back of the pre-filter.

As mentioned above, samples collected from some of the permanent stations, as well as the mobile units, were analyzed in Hattiesburg. The remainder of the samples were shipped to the Southeastern Radiological Health Laboratory, Montgomery, Alabama, for analysis. No activity above background levels was detected in any of the samples analyzed. See table 2.1 for gross beta results of an analysis of air particulate samples collected from the permanent stations from December 1 - 6, 1966. Table 2.2 indicates Radiation Surveillance Network (RSN) data from December 1 - 6 for stations located in the same part of the country.[2]

(B) Milk Sampling

Eighteen composite milk samples and seven individual family-milk-cow type samples were collected before and after the shot. These samples were submitted to Montgomery for analysis. No activity above background level was detected. Refer to Table 2.3 for milk sampling data. Figure 2.1 indicates the dairies that were represented by the composite samples. See figure 2.2 for the locations of the family type samples.

(C) Water Sampling

Selected water samples collected immediately after the shot and on a bimonthly basis since then have indicated normal background levels. The water sampling locations are shown in figure 2.6

(D) Vegetation sampling

Vegetation samples were collected before and after the shot on December 2 and December 4, respectively. Similar amounts of gross beta, gross alpha, ^{144}Ce, ^{106}Ru, ^{137}Cs, ^{95}Zr-Nb, and ^{40}K were detected in the samples that were collected before and after the shot. No activity was detected that could be attributed to the Sterling Event. Refer to figure 2.10 for vegetation sampling stations.

2.2.5 Film Badge Program

The badges were collected from the 50 film badge stations beginning on December 12, 1966. Collection began on December 8, 1966, in regard to the 66 personal film badges that were distributed. None of the badges indicated radiation exposure. See figure 2.7 for film badge station locations from 5-50 miles. See figure 2.8 for the 0-5 mile coverage.

CHAPTER 3

RESULTS

3.1 Evacuation

Thirty-one families representing 127 people were evacuated from their homes prior to the shot and returned without incident. One medical case was evacuated from his home by the project medical officer prior to the detonation and returned post-shot.

3.2 Radiation Monitoring

No radiation above normal background levels was detected by the 25 ground monitoring teams or the aerial monitoring crews.

3.3 Environmental Sampling

Analyses of environmental samples including air, milk, water, and vegetation indicated no activity that could be attributed to the Sterling Event.

3.4 Film Badges

Dosimetry results showed no exposure to any of the film badges that were distributed at the 50 stations nor did any of the 66

personal badges indicate exposure.

CHAPTER 4

CONCLUSIONS

The evacuation of the off-site residents who lived within a two-mile radius of the test site provided additional experience in conducting safety programs in relatively populous areas during underground nuclear detonations.

The data gathered, including radiation monitoring and environmental sampling results, indicated that no detectable radioactivity was released to the off-site area as a result of Sterling, thus assuring that the operation was conducted with no resultant radiation exposure to the off-site population.

REFERENCES

1. "Project Dribble, Off-Site Radiological Surveillance," Monthly Reports May 1963 - December 1965, Quarterly Reports since December 1965. Southeastern Radiological Health Laboratory, unpublished.
2. "Monthly Tabulation of Findings, Public Health Service Radiation Surveillance Network," February 1, 1967. National Center for Radiological Health.

Table 2.1 Air Data - Sterling Event - December 1-6, 1966

Location	Sample Code and/or PHS House No.	Gross Beta Activity (pCi/m^3)*		
		Maximum	Minimum	Average
Baxterville	SA1-A6	0.3	0.1	0.2
Hurricane	SA2-52	0.4	0.2	0.3
Purvis	SA3	0.2	0.1	0.2
Vardamin Griffith	SA4-25	0.3	< 0.1	< 0.2
G. C. Saul	SA5-36	0.2	0.2	0.2
Mrs. E. Powell	SA6-2	0.5	0.1	0.2
Hubert Powell	SA7-38	0.2	0.2	0.2
J. D. Keith	SA8-19	0.2	0.1	0.2
R. L. Anderson	SA9-11	0.2	< 0.1	< 0.1
W. H. Nobles, Jr.	SA10-10	0.3	0.1	0.2
Eatonville	SA11	0.2	0.1	0.2
Bassfield	SA13	0.4	0.1	0.2
Collins	SA15	0.2	0.1	0.2
Sumrall	SA16	0.2	0.1	0.2
Ellisville	SA17	0.3	0.1	0.2
Hattiesburg	SA19	< 0.1	< 0.1	< 0.1
Richton	SA21	0.2	0.1	0.2
Beaumont	SA22	0.2	0.1	0.2
Wiggins	SA23	0.2	0.1	0.2
Lumberton	SA28	0.2	0.1	0.1
Poplarville	SA29	0.2	0.1	0.2
Columbia	SA31	0.7	0.1	0.6
Tylertown	SA33	0.2	0.1	0.2
McComb	SA34	0.2	0.1	0.2
Oloh	SA37	0.3	0.2	0.2

Table 2.1 Air Data - Sterling Event - December 1-6, 1966 (Continued)

Location	Sample Code and/or PHS House No.	Gross Beta Activity (pCi/m^3)*		
		Maximum	Minimum	Average
Sartinville	SA39	0.2	0.1	0.2
Bogalusa	SA40	0.2	0.1	0.2
Vernado	SA41	0.2	0.1	0.2
Monticello	SA44	0.1	< 0.1	< 0.1
Bunker Hill	SA45	0.3	0.1	0.2
Prentiss	SA47	0.2	< 0.1	< 0.2
Oakgrove	SA48	0.3	0.2	0.2
Pine Burr	SA49	0.2	0.1	0.1

* Values of < 0.1 are assumed to be 0.1 for averaging purposes. If ten percent or more samples from a station contain < 0.1 pCi/m^3, a less-than sign is placed before the average.

Table 2.2 Air Data - RSN - December 1-6, 1966

Location	Gross Beta Activity (pCi/m^3)		
	Maximum	Minimum	Average*
Jacksonville, Florida	0.6	< 0.1	< 0.2
Atlanta, Georgia	0.2	< 0.1	< 0.2
Nashville, Tennessee	0.2	< 0.1	< 0.1
Jackson, Mississippi	0.1	< 0.1	< 0.1
Montgomery, Alabama	0.2	< 0.1	< 0.2
New Orleans, Louisiana	0.1	< 0.1	< 0.1
Austin, Texas	0.1	< 0.1	< 0.1
Little Rock, Arkansas	0.2	< 0.1	< 0.1

* Values of < 0.1 are assumed to be 0.1 for averaging purposes. If ten percent or more samples from a station contain < 0.1 pCi/m^3, a less-than sign is placed before the average.

Table 2.3

STERLING EVENT

Results of Milk Analyses

November - December , 1966

Location	Date Collected	Sample Code	Concentration of Stable Elements gm/l K	Concentration of Radionuclide (pCi/l) ^{89}Sr*	^{90}Sr	^{131}I*	^{137}Cs	^{140}Ba*
Jones Co., Miss., Bush Dairy, Laurel Rt. A. Jones Co.	11/25/66	SM-1679	1.47	< 5	22	< 10	15	< 10
	12/13/66	SM-1727	1.47	< 5	22	< 10	20	< 10
Biloxi, Miss., Borden, Rt. 1, Farmer, Wiggins	11/25/66	SM-1680	1.57	< 5	34	10	25	< 10
	12/13/66	SM-1729	1.47	< 5	24	< 10	30	< 10
Biloxi, Miss. Borden Co., Moses, Rt. 1	11/25/66	SM-1682	1.57	< 5	19	< 10	15	< 10
	12/14/66	SM-1723	1.51	< 5	18	< 10	15	< 10
Biloxi, Miss. Borden Co., Ladner Rt. 2 Lower Rt.	11/25/66	SM-1683	1.46	< 5	27	< 10	30	< 10
	12/13/66	SM-1720	1.41	< 5	29	< 10	25	< 10
T. C. Smith Rt. 1	11/25/66	SM-1684	1.44	< 5	32	10	15	10
	12/13/66	SM-1717	1.48	< 5	30	< 10	20	< 10
Biloxi, Miss. Borden Co., Shaw Rt. 2, Upper Rt. Jones Co.	11/25/66	SM-1685	1.37	< 5	20	< 10	15	10
	12/13/66	SM-1718	1.43	< 5	23	< 10	15	< 10
T. C. Smith Rt. 4 Walthall & Marion Counties	11/24/66	SM-1686	1.58	< 5	18	< 10	15	< 10
	12/14/66	SM-1728	1.45	< 5	17	< 10	20	< 10
Biloxi, Miss. Borden Co., Shaw Rt. 1, Lower Rt.	11/26/66	SM-1696	1.44	< 5	27	< 10	40	< 10
	12/14/66	SM-1740	1.65	< 5	31	< 10	25	< 10
Picayune, Miss. Country Girl Dairy, Stanford, Rt. 2	11/26/66	SM-1697	1.58	< 5	21	< 10	35	< 10
	12/14/66	SM-1733	1.57	< 5	25	< 10	45	< 10

Table 2.3 (continued)

STERLING EVENT

Results of Milk Analyses

November - December, 1966

Location	Date Collected	Sample Code	Concentration of Stable Elements gm/l K	Concentration of Radionuclides pCi/l ^{89}Sr*	^{90}Sr	^{131}I*	^{137}Cs	^{140}Ba*
Picayune, Miss.	11/27/66	SM-1698	1.47	< 5	21	< 10	25	< 10
Country Girl Dairy, Stanford Rt. 1	12/13/66	SM-1736	1.48	< 5	25	< 10	25	< 10
T. C. Smith Rt. 3	11/25/66	SM-1681	1.55	< 5	32	10	15	10
Walthall Co.	12/14/66	SM-1726	1.44	< 5	26	< 10	20	< 10
USPHS B12	11/30/66	SM-1700	1.52	< 5	112	< 10	35	< 10
Jimmy McGraw	12/15/66	SM-1734	1.44	< 5	125	< 10	40	< 10
USPHS C11	11/30/66	SM-1701	1.20	< 5	43	20	25	< 10
R.H.Johnson	12/15/66	SM-1732	1.21	< 5	41	< 10	30	< 10
USPHS C21	11/30/66	SM-1702	1.55	< 5	13	< 10	25	< 10
A.V. Johnson	12/15/66	SM-1738	1.56	< 5	49	< 10	65	< 10
USPHS B23	11/30/66	SM-1703	1.88	< 5	108	20	85	20
Henry Smith	12/15/66	SM-1731	1.76	< 5	77	< 10	125	< 10
USPHS 1	11/30/66	SM-1704	1.64	< 5	12	< 10	45	< 10
L. J. Bryant	12/15/66	SM-1739	1.55	< 5	45	< 10	45	< 10
USPHS 31	11/30/66	SM-1705	1.40	< 5	14	20	30	20
Otho Johnson	12/15/66	SM-1735	1.34	< 5	103	< 10	30	< 10
USPHS D21	11/30/66	SM-1706	1.15	< 5	62	< 10	65	10
Roland Burge	12/15/66	SM-1737	1.13	< 5	36	< 10	20	< 10

* Data have been corrected for decay to the date of sample collection.

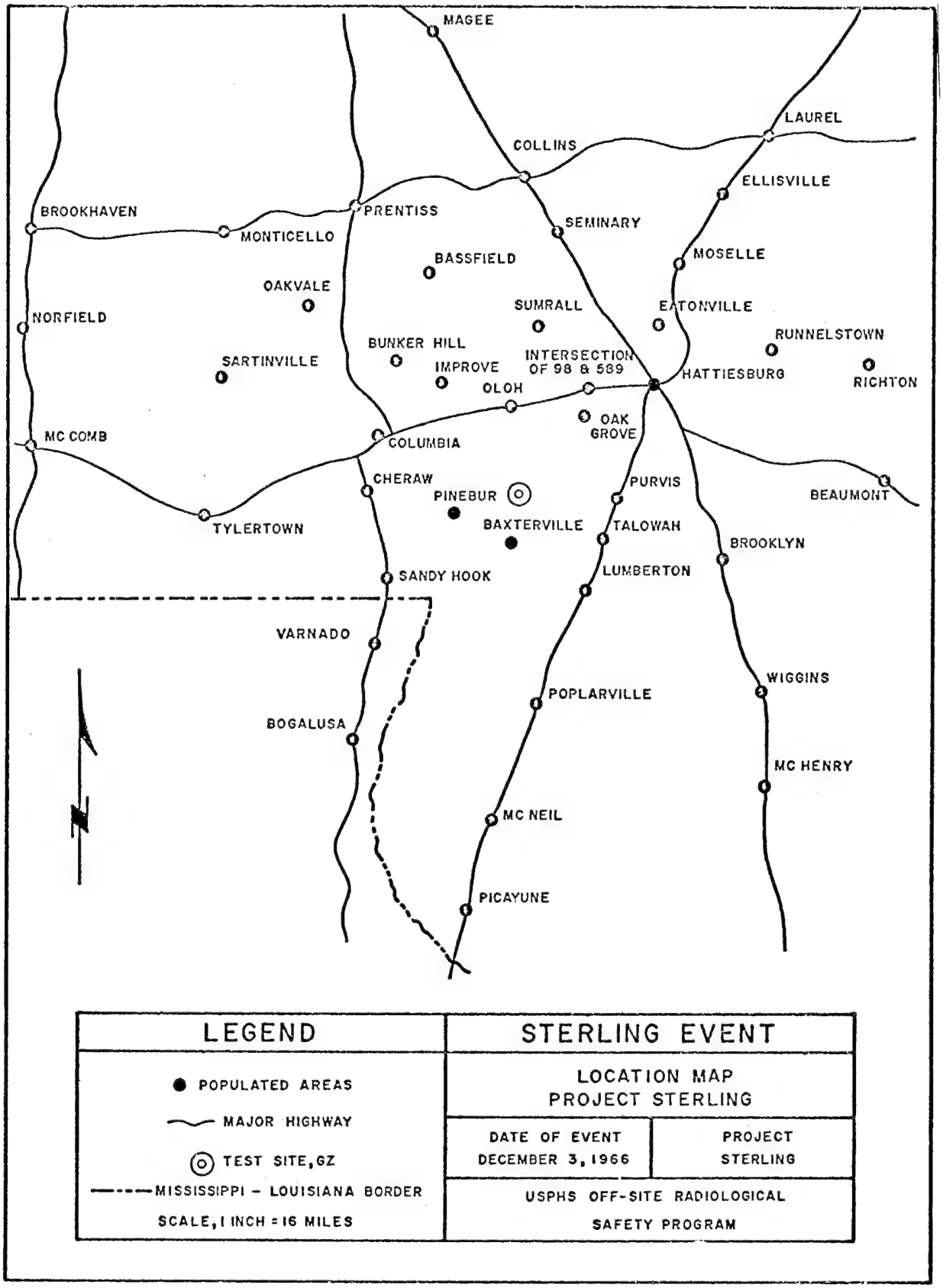


FIGURE 1.1 LOCATION MAP, PROJECT STERLING

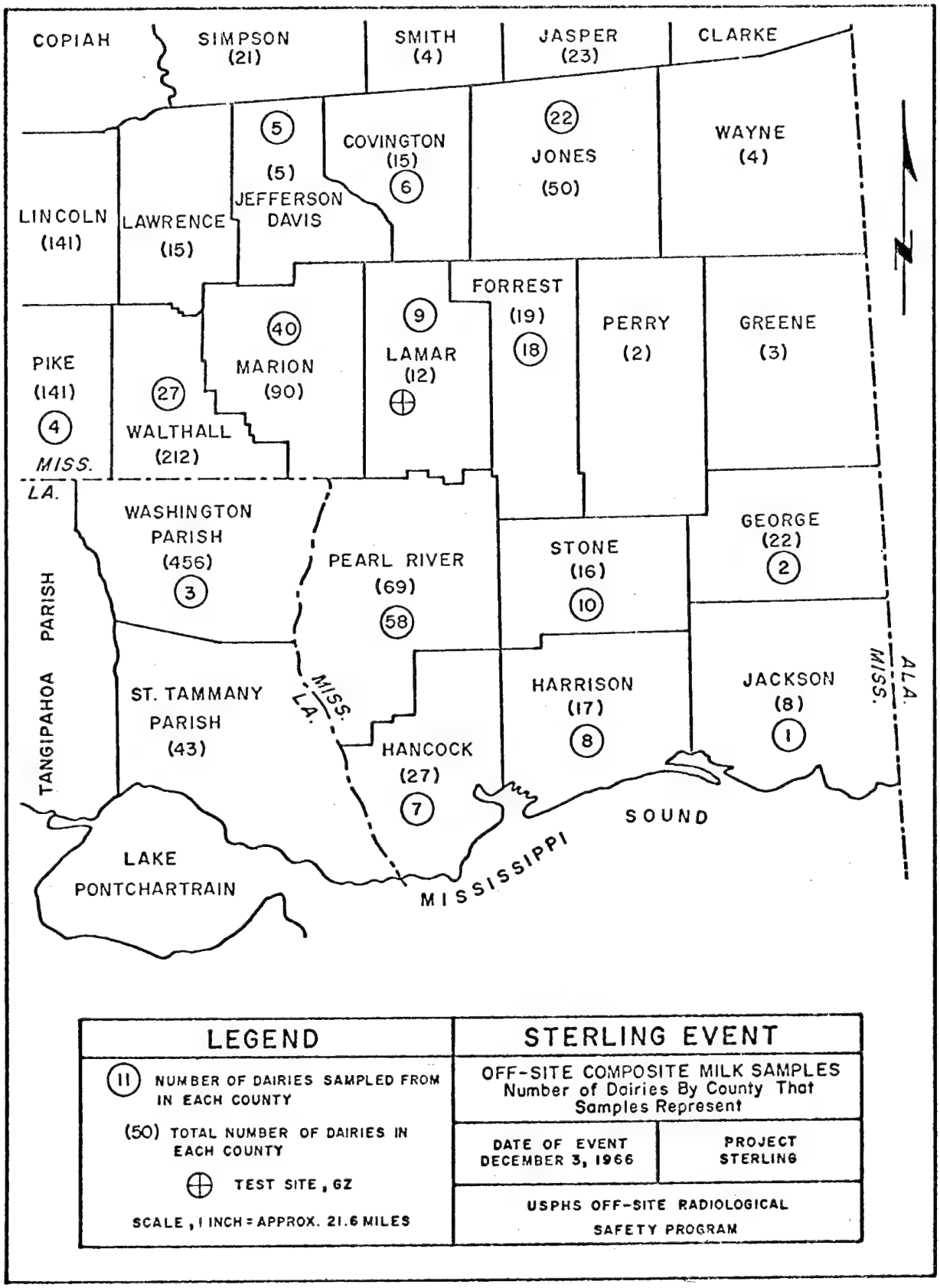
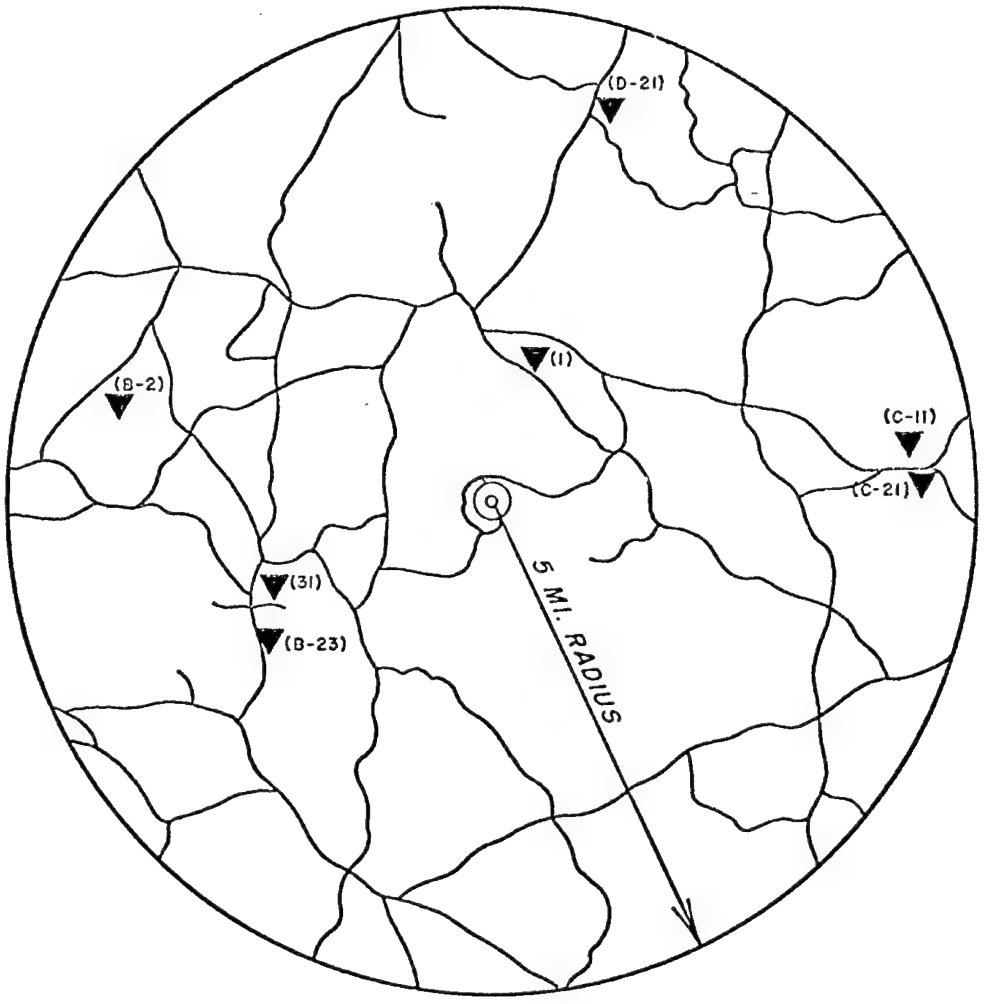


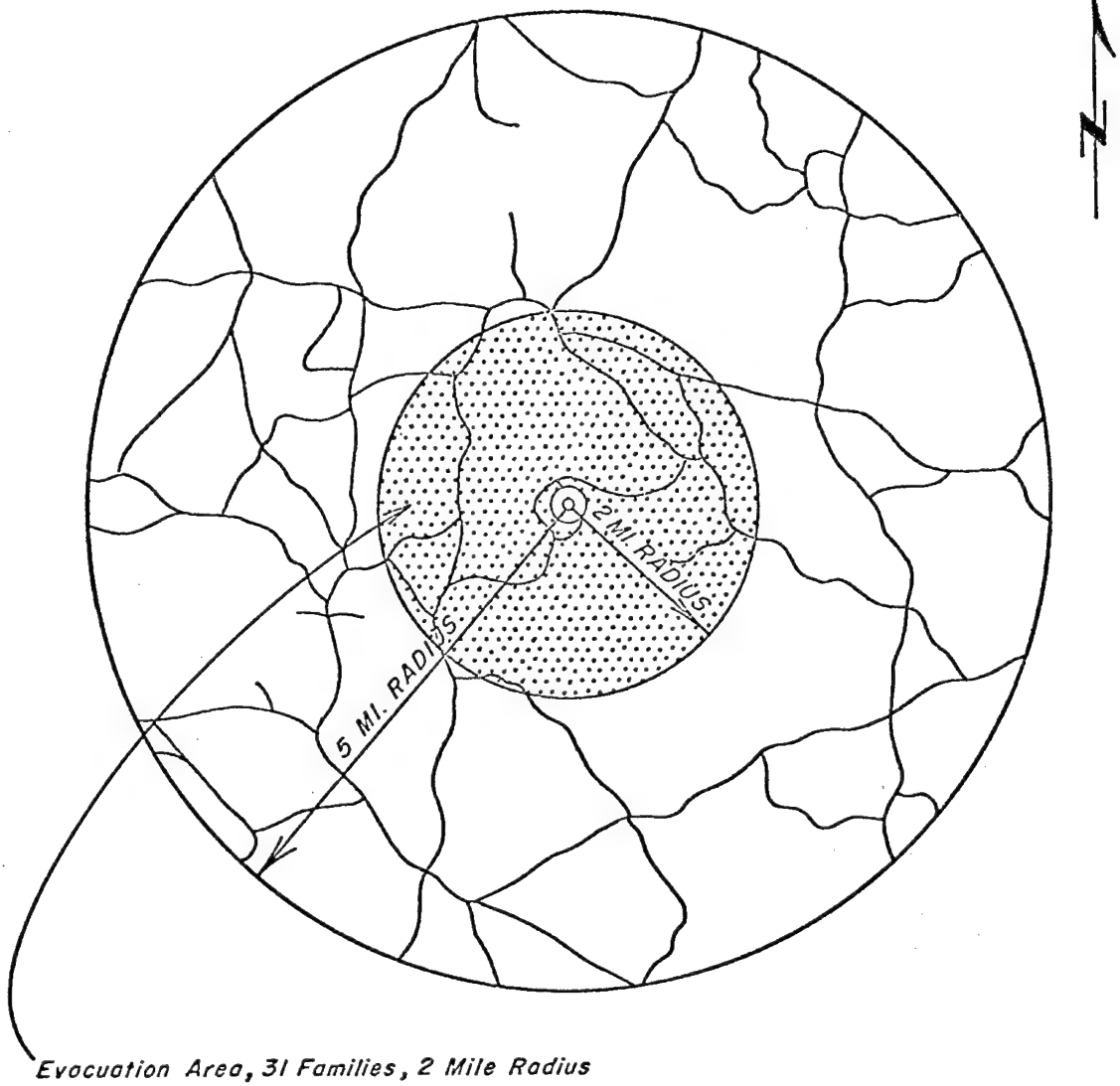
FIGURE 2.1 OFF-SITE MILK SAMPLING COVERAGE, COMPOSITE SAMPLES



NOTE: ALL STATION CODE NUMBERS ARE PREFIXED BY THE LETTERS DM

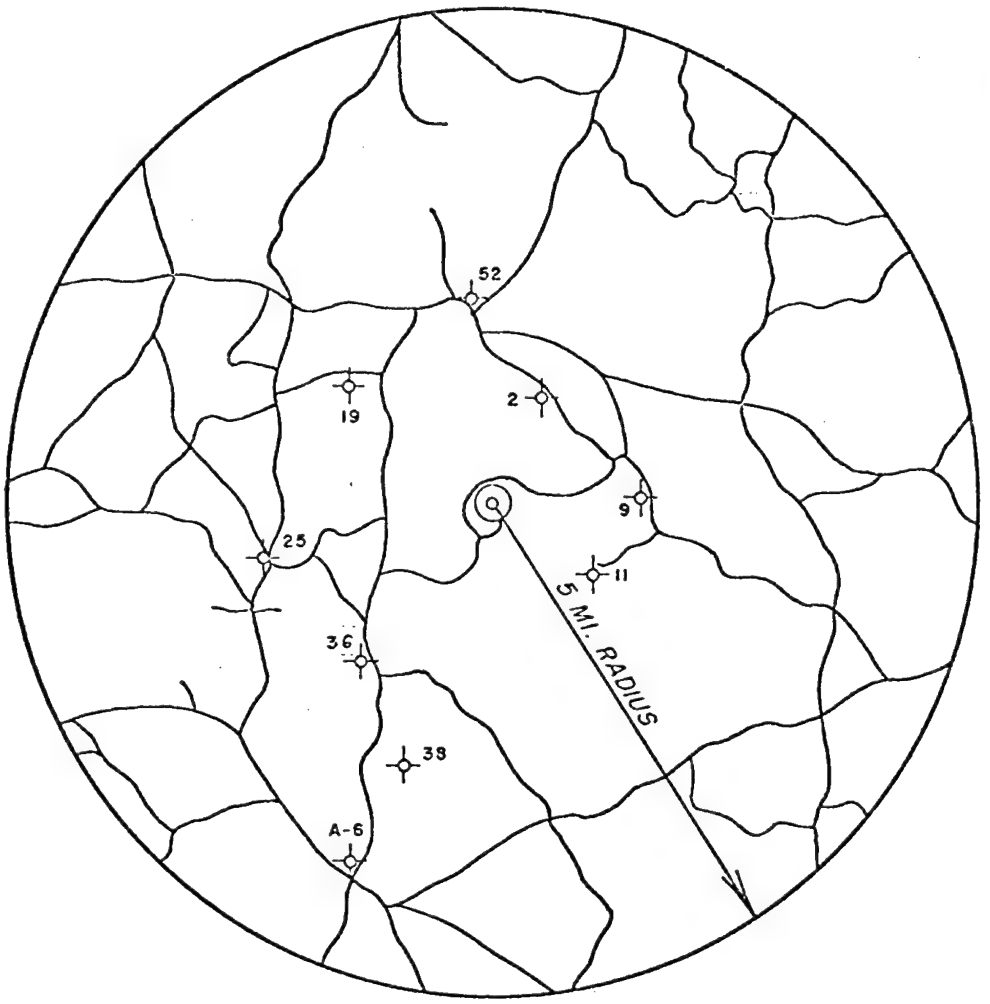
LEGEND	STERLING EVENT	
(D-1) ▼ MILK SAMPLING STATION	OFF-SITE MILK SAMPLING STATIONS WITHIN 5-MILE RADIUS	
~ MAJOR ROAD	DATE OF EVENT DECEMBER 3, 1966	PROJECT STERLING
⊙ TEST SITE, GZ	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM	
SCALE, 1 INCH = 2 MILES		

FIGURE 2.2 OFF-SITE MILK SAMPLING STATIONS WITHIN 5 MILE RADIUS



LEGEND	STERLING EVENT
EVACUATION AREA MAJOR ROAD TEST SITE, GZ SCALE, 1 INCH = 2 MILES	EVACUATION AREA
	DATE OF EVENT: DECEMBER 3, 1966 — PROJECT: STERLING
	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM

FIGURE 2.3 EVACUATION AREA



LEGEND	STERLING EVENT	
PERMANENT AIR SAMPLING STATION	PERMANENT AIR SAMPLING STATIONS 0-5 MILES	
TEST SITE, GZ	DATE OF EVENT DECEMBER 3, 1966	PROJECT STERLING
SCALE, 1 INCH = 2 MILES	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM	

FIGURE 2.4 PERMANENT AIR SAMPLING STATIONS 0-5 MILES

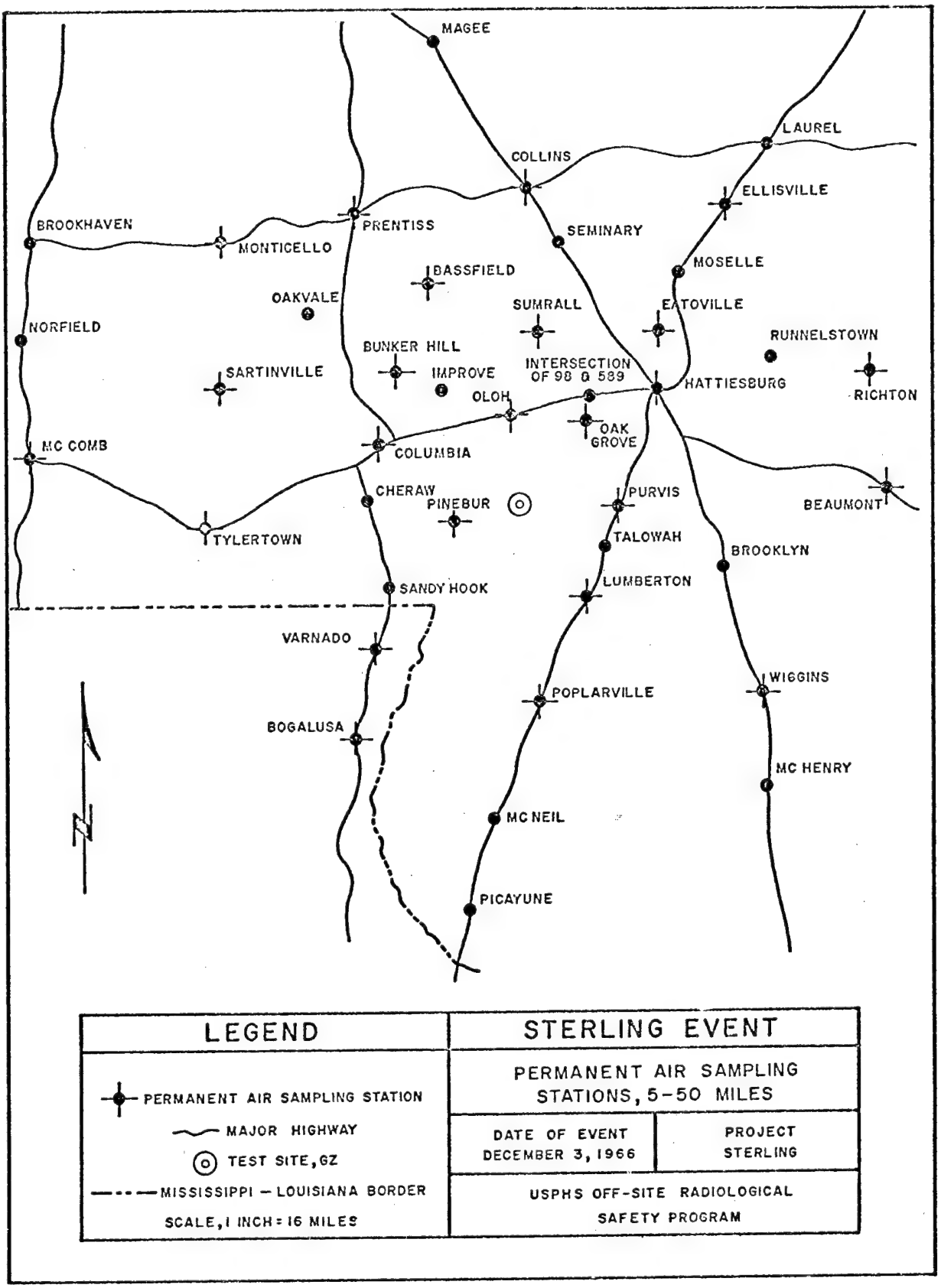
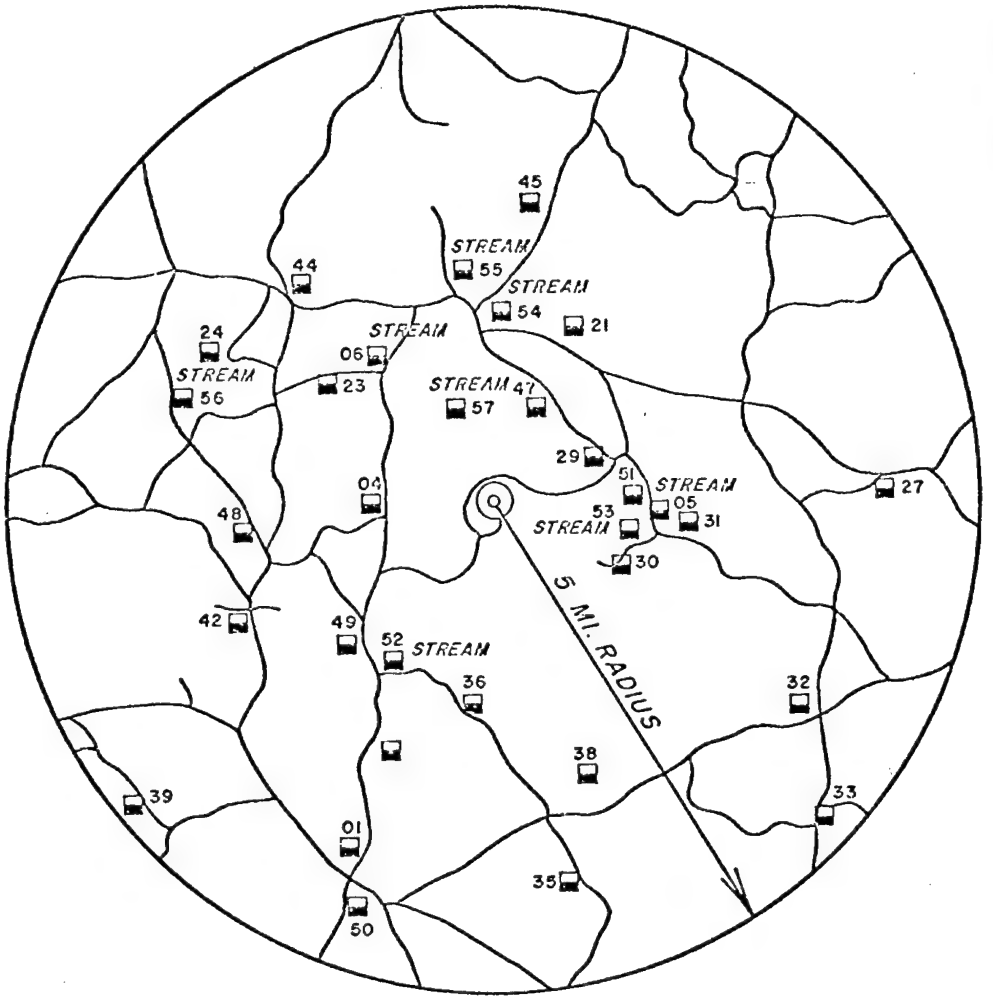


FIGURE 2.5 PERMANENT AIR SAMPLING STATIONS, 5-50 MILES



NOTE: ALL STATION CODE NUMBERS ARE PREFIXED BY THE LETTERS DW

NOTE: THE FOLLOWING SAMPLING STATIONS ARE NOT SHOWN: HATTIESBURG (N52°E,20MI.) DW-07, PURVIS (S68°E,10.5MI.) DW-03, POPLARVILLE (S5°E,21.5 MI.) DW-10, COLUMBIA (N67°W,16MI.) DW-08, LUMBERTON (S36°E,12MI.) DW-09

LEGEND	STERLING EVENT	
01 WATER SAMPLING STATION	OFF-SITE WATER SAMPLING STATIONS	
MAJOR ROAD	DATE OF EVENT DECEMBER 3, 1966	PROJECT STERLING
TEST SITE, GZ	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM	
SCALE, 1 INCH = 2 MILES		

FIGURE 2.6 OFF-SITE WATER SAMPLING STATIONS

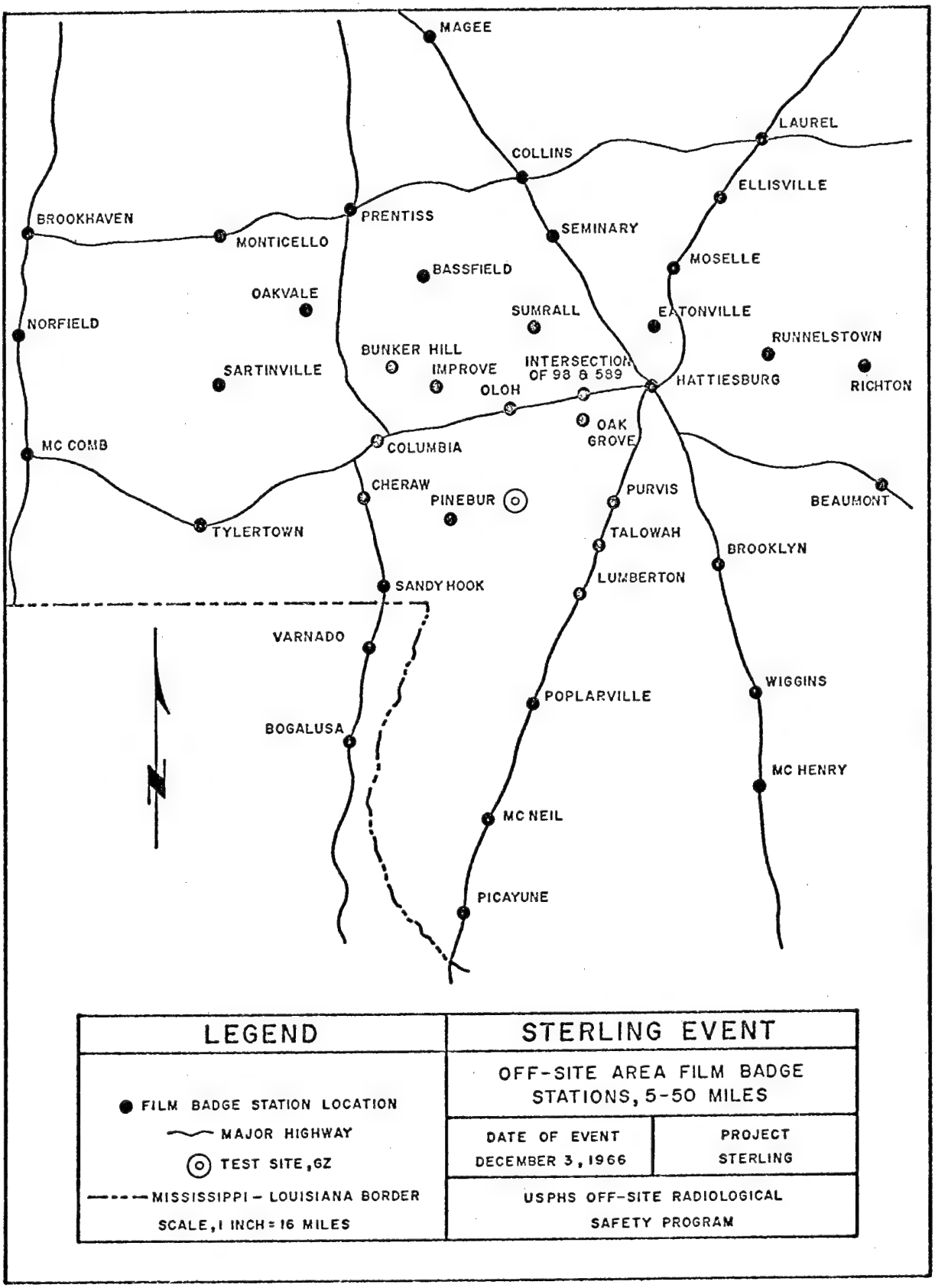
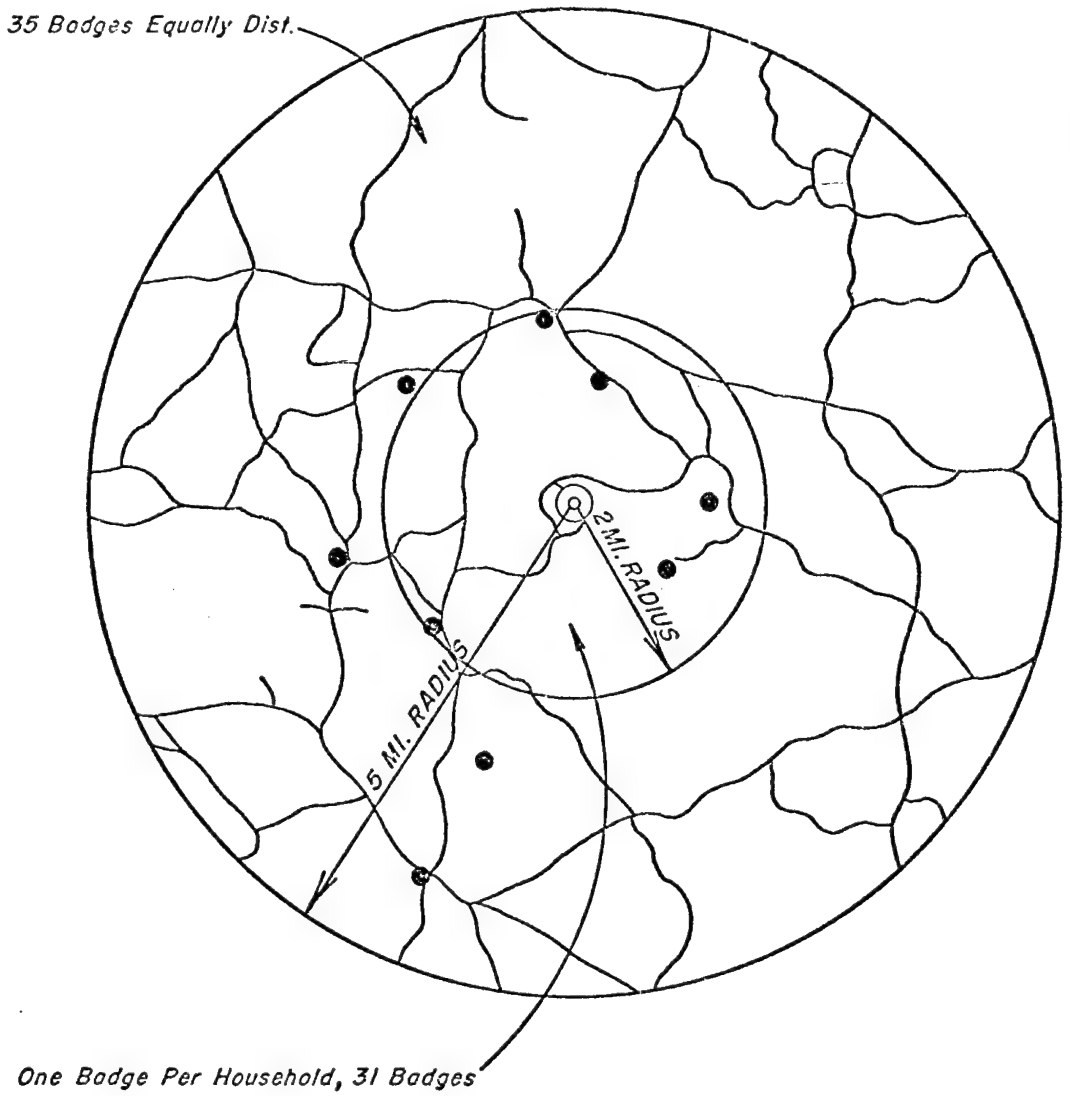


FIGURE 2.7 OFF-SITE AREA FILM BADGE STATIONS, 5-50 MILES



LEGEND	STERLING EVENT	
FILM BADGE STATION	PERSONAL FILM BADGES, FILM BADGE STATIONS WITHIN 5 MILE RADIUS	
MAJOR ROAD	DATE OF EVENT DECEMBER 3, 1966	PROJECT STERLING
TEST SITE, 6Z	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM	
SCALE, 1 INCH = 2 MILES		

FIGURE 2.8 PERSONAL FILM BADGES, FILM BADGE STATIONS WITHIN 5 MILE RADIUS

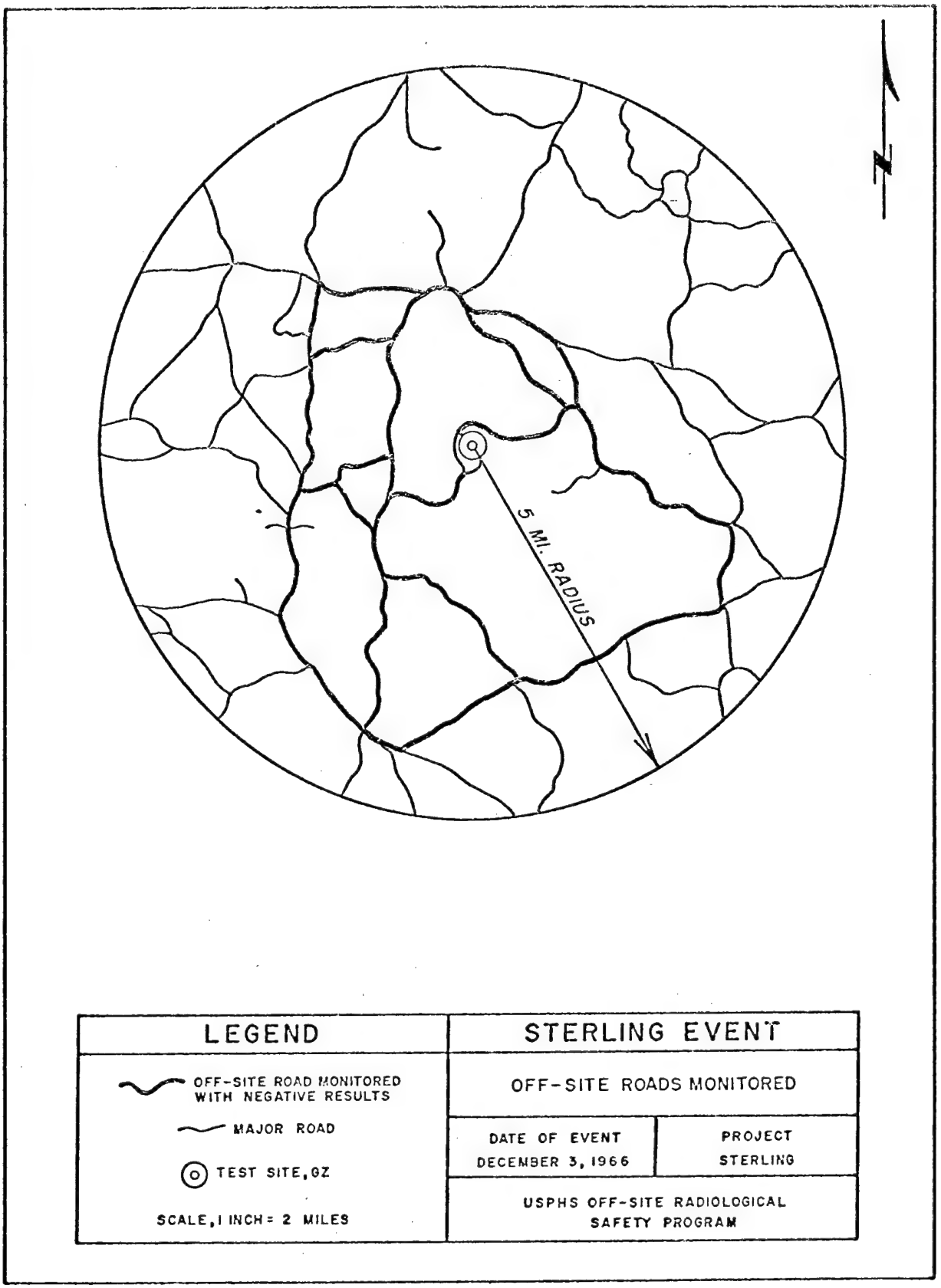
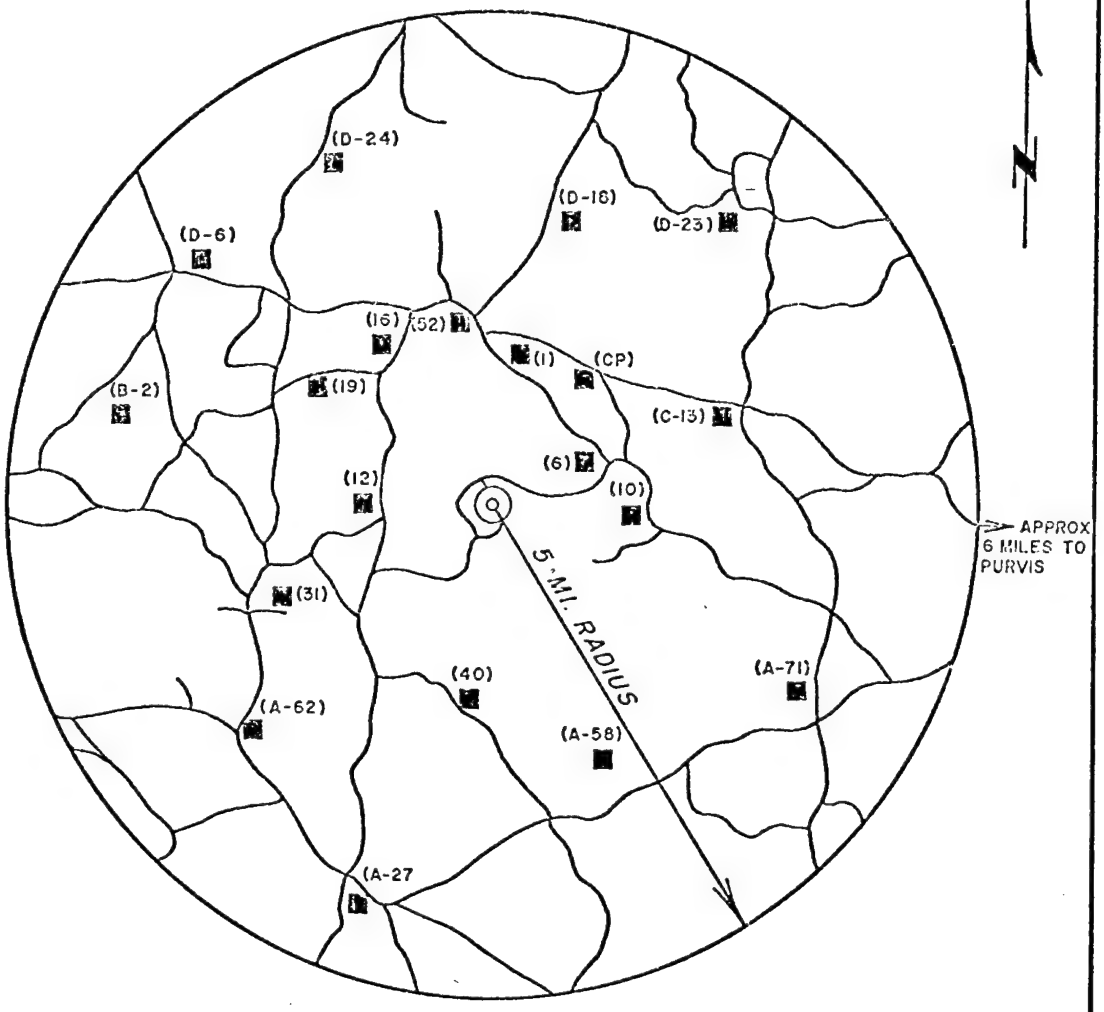


FIGURE 2.9 OFF-SITE ROADS MONITORED



NOTE: ALL STATION CODE NUMBERS ARE PREFIXED BY THE LETTERS DV

LEGEND	STERLING EVENT	
(1) ■ VEGETATION SAMPLING STATION	OFF-SITE VEGETATION SAMPLING STATIONS	
~~ MAJOR ROAD	DATE OF EVENT DECEMBER 3, 1966	PROJECT STERLING
⊙ TEST SITE, GZ	USPHS OFF-SITE RADIOLOGICAL SAFETY PROGRAM	
SCALE, 1 INCH = 2 MILES		

FIGURE 2.10 OFF-SITE VEGETATION SAMPLING STATIONS

PROJECT STERLING REPORTS

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ERC	VUF-1035	Analyses of Ground Motion and Containment
USPHS	VUF-1036	Off-Site Surveillance
ESSA/ARFRO	VUF-1037	Weather & Radiation Predictions
REECo	VUF-1038	On-Site Health and Safety
FAA	VUF-1039	Federal Aviation Agency Airspace Advisory
H-NSC	VUF-1040	Hydrologic Safety Evaluation
USBM	VUF-1041	Pre- and Post-Shot Safety Inspections of Oil and Gas Facilities
USGS	VUF-1042	Well Aquifer Response to the Sterling Event, Tatum Dome
USGS	VUF-1043	Chemical and Radio-Chemical Quality of Water Following the Sterling Event
JAB	VUF-1044	Structural Response

TECHNICAL REPORTS

LRL, SC	VUF-3025	Subsurface Phenomenology Measurements Near a Decoupled Nuclear Event
USC&GS USGS GEO TECH LRL	VUF-3026	Decoupling of Seismic Waves By a Shot-Generated Cavity
TI	VIF-3027	Radioactive Gas Analysis
II	VUF-3028	Detection of Radionuclides

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Participating in Project Sterling

ERC	Environmental Research Corporation Alexandria, Virginia
ESSA/ARFRO	Environmental Science Services Administration Air Resources Field Research Office Las Vegas, Nevada
FAA	Federal Aviation Agency Los Angeles, California
GEO TECH	Geotechnical Corporation Garland, Texas
H-NSC	Hazelton-Nuclear Science Corporation Palo Alto, California
II	Isotopes, Inc. Westwood, New Jersey
JAB	John A. Blume San Francisco, California
LRL	Lawrence Radiation Laboratory Livermore, California
REECo	Reynolds Electrical & Engineering Co., Inc. Las Vegas, Nevada
SC	Sandia Corporation Albuquerque, N. M.
TI	Texas Instruments, Inc. Dallas, Texas
USBM	U. S. Bureau of Mines
USC&GS	U. S. Coast & Geodetic Survey Las Vegas, Nevada
USGS	U. S. Geologic Survey Denver, Colorado
USPHS	U. S. Public Health Service Las Vegas, Nevada

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